TIER 1

UNDERGROUND INJECTION CONTROL
PERMIT APPLICATION

Ute Tribal # 31-05
1980' FNL & 660' FWL
Sec. 31, T5S-R3W
Duchesne County, Utah
API # 43-013-32035

July 2015

Prepared for:
Bruce Suchomel
Groundwater Program, Mail Code 8P-W-UIC
U.S. Environmental Protection Agency
1595 Wynkoop St
Denver, CO 80202-1129

Prepared by:
Petroglyph Energy, INC.
960 Broadway Avenue, Suite 500, P.O. Box 70019
Boise, Idaho 83707
(208) 685-7600
FAX (208) 685-7605

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PERMIT APPLICATION

- CBL unreadable amplified?
- DEVIATION LOGS.
- SUNDRY RPTS
- CBLS FOR AOR WELLS
- HOW WAS USDW DERIVED

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LIST OF ATTACHMENTS

SUMMARY DOCUMENT
UIC WELL APPLICATION
Ute Tribal 31-05
API # 43-013-32035

The following document contains information provided in support of the application for the conversion of the Ute Tribal 31-05 well to an injection well in the Green River formation in the Antelope Creek Field in Duchesne County, Utah.

The Antelope Creek Field falls within the Uintah and Ouray Indian reservations and is within Indian Country; therefore, for facilities located on the reservation, only EPA-issued UIC permits are necessary for compliance with UIC regulations.

The EPA has issued an Area Permit #UT20736-00000 for the Underground Injection Control for the Antelope Creek Field. This area permit allows for additional producing wells to be converted to injection wells for enhanced recovery.

(1) Petroglyph Energy, Inc. (Petroglyph) is the operator and only working interest owner of wells located in the Antelope creek Field, Duchesne County, Utah. Petroglyph's business address is provided below:

Petroglyph Energy, Inc.
960 Broadway Avenue, Suite 500
P.O. Box 70019
Boise, ID 83707

(2) Enclosed as Attachment No. 1 is a topographic map of a portion of the Antelope Creek Field, identifying all wells located in this area. The legal location for the Ute Tribal 31-05 is 1980' FNL & 660' FWL SW/NW Sec. 31, T5S-R3W.

(3) Attachment No. 2 is a map of the well. This map shows a circle with a ¼ mile radius centered on the Ute Tribal 31-05 well. The ¼ mile radius encompasses the area of review, AOR, within which Petroglyph is required to investigate all wells for mechanical integrity. The ¼ mile radius also identifies mineral ownership; those lands, and the the owners thereof, which must be provided notice of this application. The AOR has Ute Tribal 31-04 and Ute Tribal 31-12 well(s) located in its ¼ mile radius.

(4) Petroglyph proposes to utilize the Ute Tribal 31-05 as an injection well for enhanced recovery in the Antelope Creek Field.

(5) Injection Zone – The injection intervals are between 3420' and 5388' True Vertical Depth and located in the lower portion of the Green River Formation. The injection zone is confined within a 1968' section between the Green River "A" Lime marker bed and the top of the Basal Carbonate in the lower part of the formation. The injection zone is composed of lenticular calcareous sandstones interbedded with low permeable carbonates and calcareous shales. The lenticular sandstones vary in thickness from 1 to 30 feet.

Confining Zone – The overall confining strata above the injection zone consists of impermeable Green River calcareous shales and continuous beds of microcrystalline dolostone. The confining zone in the Ute Tribal 31-05 is 223 feet thick.

Attachment No. 3 is a structure map of the A-Marker surface.

Attachment No. 4 is a cross-section of the injection interval and confining zone.

(6) Enclosed as Attachment No. 5 are standard analyses of produced water from three batteries that currently serve as central handling facilities for all project producing wells. The analysis of the Green River formation water from the Ute Tribal 18-08 Satellite Battery is 12805 mg/L of total dissolved solids (TDS), Ute Tribal 21-11 Satellite Battery is 15659 mg/L TDS, and Ute Tribal 34-12-D3 Satellite Battery is 14590 mg/L TDS.

Injectate in the field is a mixture of produced water and fresh make-up water. The nearest injection well is the Ute Tribal 19-13, the most recent analysis of the water being injected into the Green River formation at this location is 7342 mg/L TDS. This analysis is also included in Attachment No. 5.

(7) A summary of completion data from the Ute Tribal 31-05 and offset wells in the AOR are included in Attachment No. 6

(8) The cement bond log is included in Attachment No. 7.

(9) The open hole log for the Ute Tribal 31-05 is included in Attachment No. 8.

(10) The Antelope Creek Field is operated under a Cooperative Plan of Development between the Ute Tribe and Petroglyph Energy. At the Ute Tribal 31-05 location, all mineral owners, surface owners and operators located within the AOR ¼ mile radius have been notified of the submitted EPA application to convert to injection. Attachment No. 9 is the Affidavit of Notification to all owners.

(11) Petroglyph requests a maximum surface injection pressure of **1730**psi. The EPA Area Permit No. UT20736-00000 uses the formula:

Pm = (0.88psi/ft - 0.43psi/ft(Sg)) D

Where:
Pm = Maximum surface injection pressure
0.88psi/ft = Fracture gradient
D = Top perforation depth
0.43psi/ft = Hydrostatic pressure/hydraulic head
Sg = Specific gravity of injection fluid

For the Ute Tribal 31-05:
1730psi = (0.88psi/ft - 0.43(1.00)) 3844ft

(12) Three wellbore diagrams for the Ute Tribal 31-05 are in Attachment No. 10. One diagram is for production, one for injection, and one for Plug & Abandonment (P&A).

(13) The P&A procedure for this well is shown in Attachment No. 11.

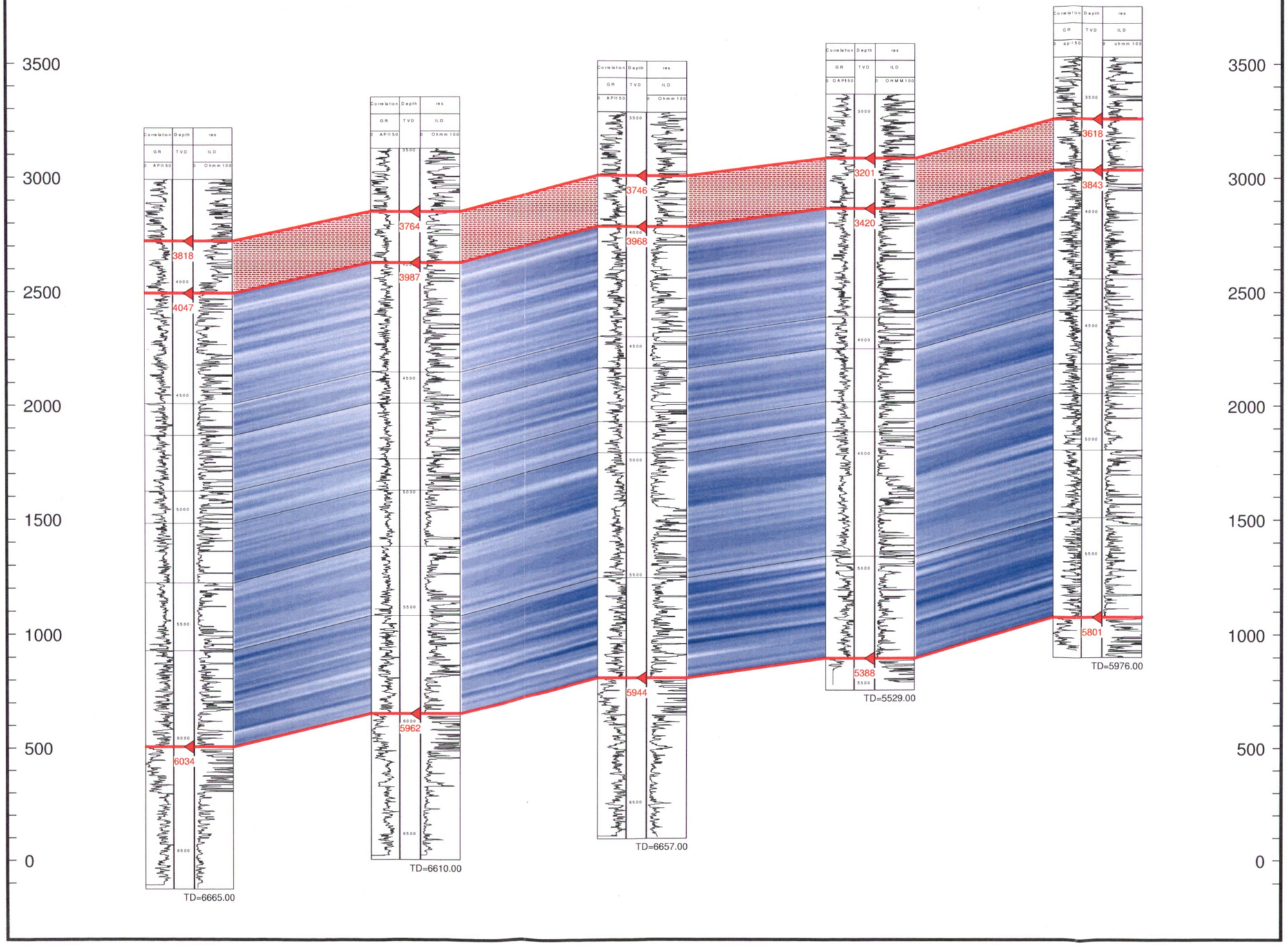
(14) Once the draft permit is issued, Petroglyph will conduct a Mechanical Integrity Test and a static bottom-hole pressure test. The MIT procedure is contained in Attachment No. 12. The conversion work will be satisfactorily completed and submitted to the EPA on Form 7520-12. A wellbore schematic will be included with this form.

(15) Petroglyph will give proof of financial responsibility by posting a surety bond for the UIC well prior to final permit approval. A copy of this letter is contained in Attachment No. 13.

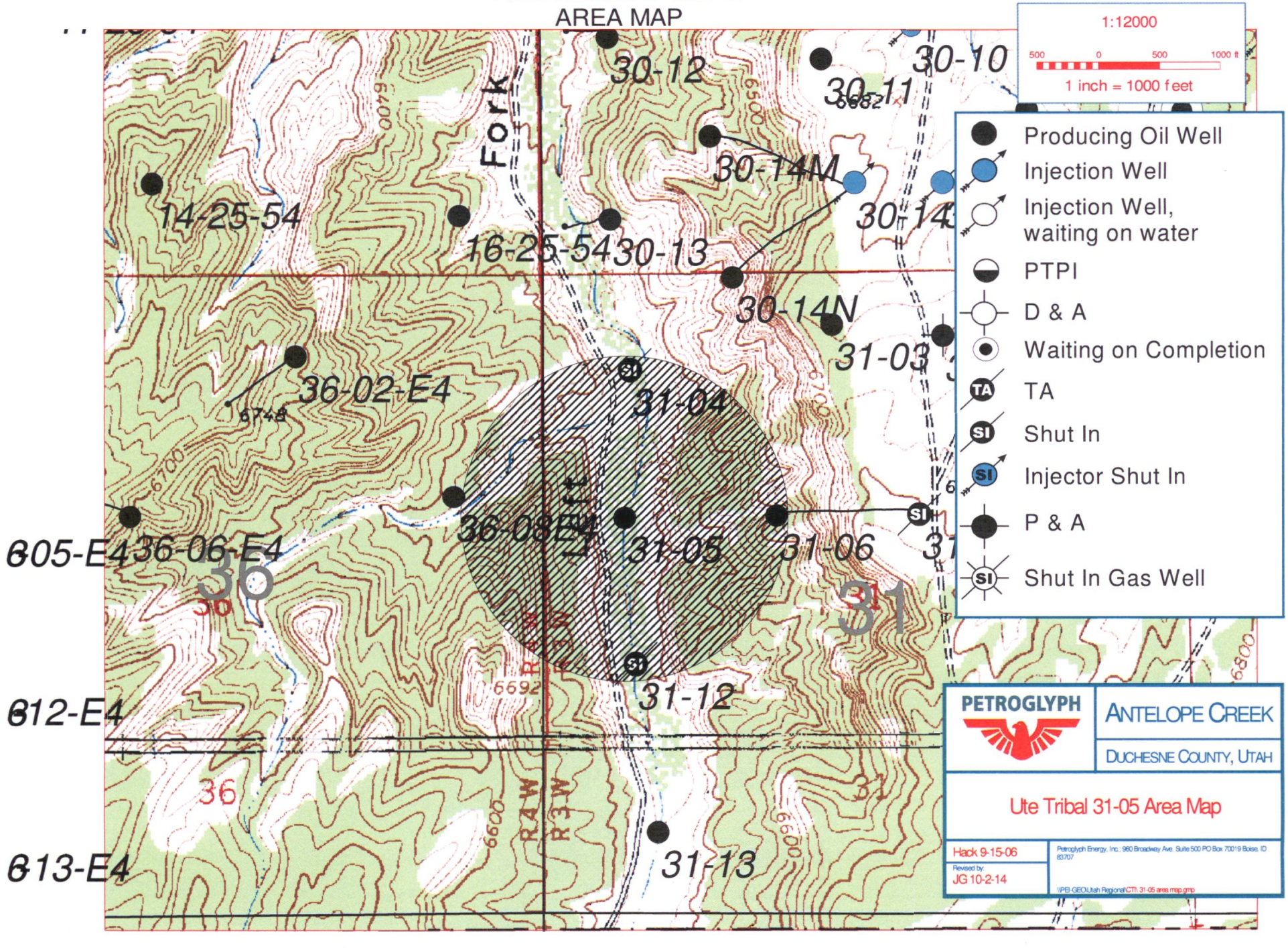
(16) Petroglyph will install various gauges on the well so that the injection pressure and tubing/casing annulus pressure can be monitored. The well will be equipped with a flow meter with a cumulative volume recorder.

Structural Cross Section in the Vicinity of Ute Tribal 31-05

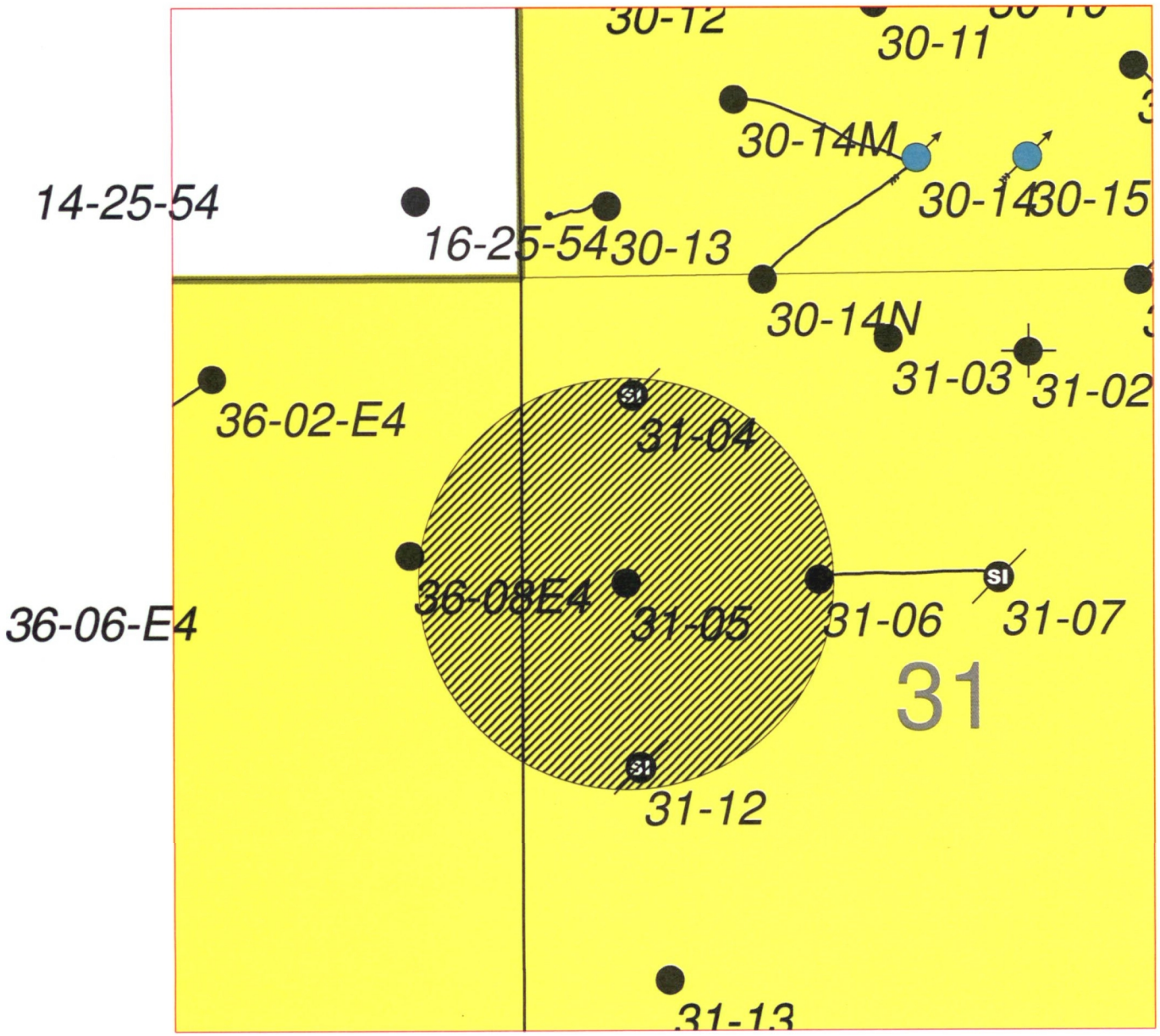
43013308030000	2903 ft	43013308520000	3842 ft	43013311880000	2303 ft	43013320350000	5807 ft	43013516030000
PETROGLYPH OPERATING COMPANY INC Ute Tribal 19-16 556 FSL 603 FEL TWP: 5 S - Range: 3 W - Sec. 19		PETROGLYPH OPERATING COMPANY INC Ute Tribal 30-07 1980 FNL 1980 FEL TWP: 5S - Range: 3W - Sec. 30		PETROGLYPH OPERATING COMPANY INC Ute Tribal 31-03 422 FNL 2338 FWL TWP: 5 S - Range: 3 W - Sec. 31		PETROGLYPH OPERATING COMPANY INC Ute Tribal 31-05 1980 FNL 660 FWL TWP: 5 S - Range: 3 W - Sec. 31		PETROGLYPH OPERATING COMPANY UTE TRIBAL 36-13-E4 954 FSL 935 FWL TWP: 5 S - Range: 4 W - Sec. 36



ATTACHMENT NO. 1:
AREA MAP



ATTACHMENT NO. 2:
SITE MAP



1:12000

500 0 500 1000 ft

1 inch = 1000 feet

- Producing Oil Well
- Injection Well
- Injection Well, waiting on water
- PTPI
- D & A
- Waiting on Completion
- TA
- Shut In
- Injector Shut In
- P & A
- Shut In Gas Well

PETROGLYPH

ANTELOPE CREEK

DUCHESNE COUNTY, UTAH

Ute Tribal 31-05 Plat and Quarter-mile radius map. Ute Indian lands under Petroglyph lease shown in yellow

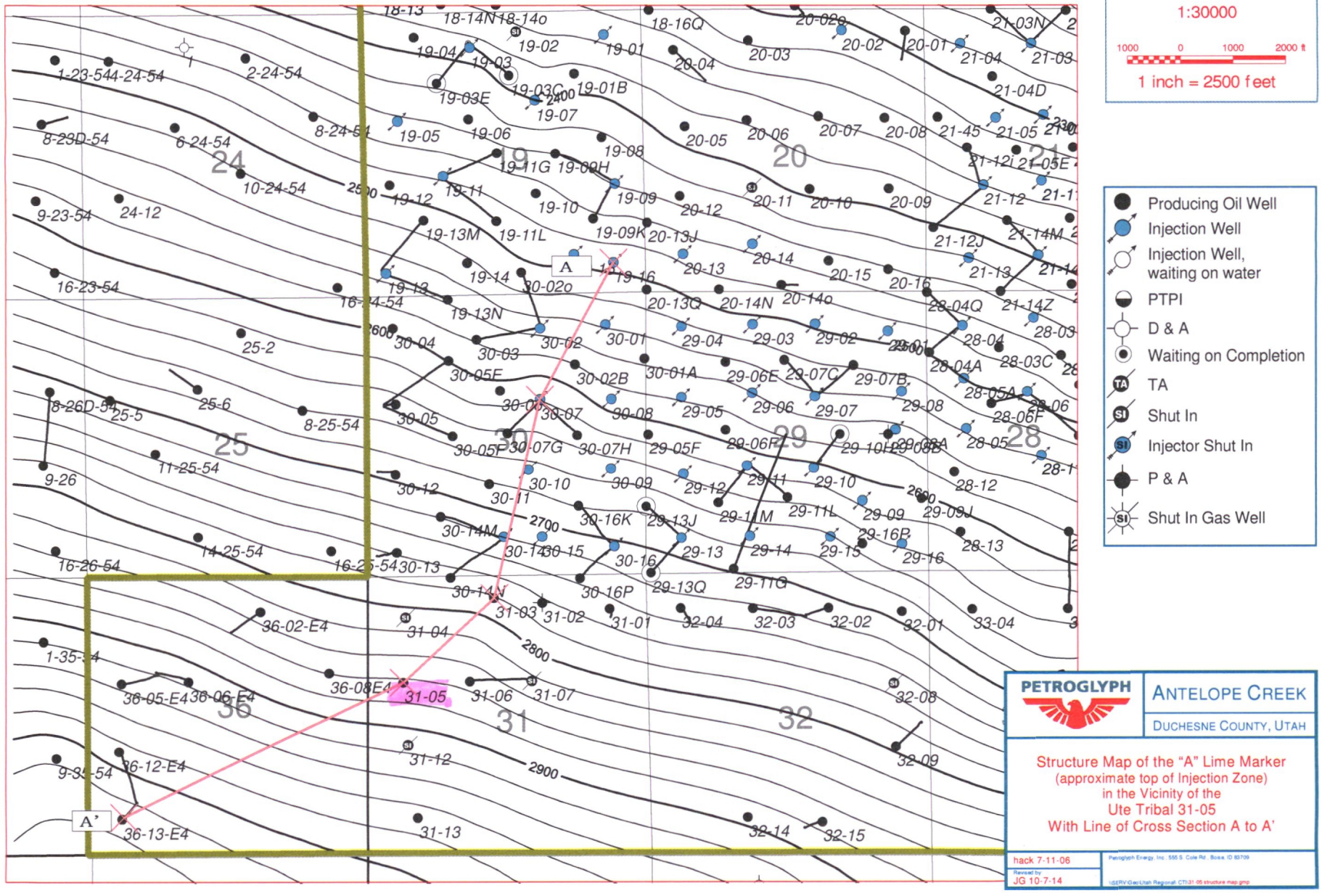
Hack 9-15-06

Revised by:
JG 9-10-14

Petroglyph Energy, Inc.; 960 Broadway Ave. Suite 500 PO Box 70019 Boise, ID 83707

\\PEI-GEO\Utah Regional\CTI\ 31-05 quarter mile map.gmp

ATTACHMENT NO. 3:
Map of the "A" Lime Marker



Ute Tribal 31-05 Well History

Well History:

Spud Well: 3/14/1998

Completed: 4/30/1998

First Production: 5/6/1998

Tops (KB):

BMSW* Found at 1284'

Green River 954'

A Marker 3420'

X Marker 3895'

Douglas Creek 4034'

B Limestone 4400'

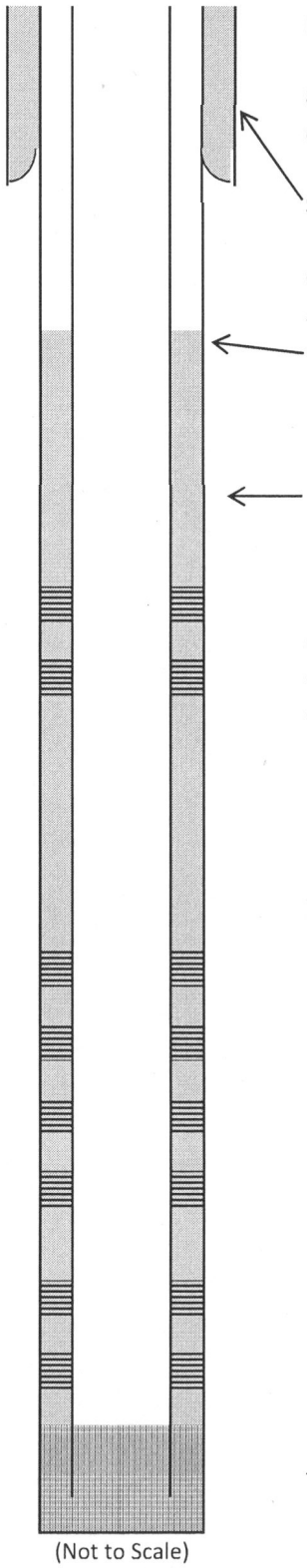
Castle Peak 4897'

Basal Carbonate 5388'

Perf History

4/25/1998

B11.1	3844' to 3848'
C02	3971' to 3975'
C06	4218' to 4221'
C09.2	4346' to 4352'
D01	4420' to 4424'
D3	4465' to 4468'
D3	4499' to 4502'
D7	4639' to 4643'
E01.1	4960' to 4966'
E01.2	5010' to 5016'



GL: 6274'

KB: 6284'

8 5/8" 24# Surface CSG @ 368' KB

cmt'd w/300 sx

Surface Hole size 12 1/4"

Cement top @ 1656'

5 1/2" 15.5# J-55 CSG @ 5483'

cmt'd w/430 sx

Hole Size 7 7/8" bit

Perf's:

B11.1 3844' to 3848'

C02 3971' to 3975'

C06 4218' to 4221'

C09.2 4346' to 4352'

D01 4420' to 4424'

D3 4465' to 4468'

D3 4499' to 4502'

D7 4639' to 4643'

E01.1 4960' to 4966'

E01.2 5010' to 5016'

PBTD @ 5421' KB

TD @ 5582' KB

(Not to Scale)

Petroglyph Operating Co., Inc.

Ute Tribal #31-05

(1980' FNL & 660' FWL)

SW NW Section 31, 5S- 3W

Antelope Creek Field

Duchesne Co. Utah

API#: 43013320350000

*Plate 1 Utah Geological Survey Special Study 144. (2012). *BMSW Elevation Contour Map, Uinta Basin, Utah.* [map]. (CA 1:200,000)

Ute Tribal 31-05 Injection

Well History:

Spud Well: 3/14/1998

Completed: 4/30/1998

First Production: 5/6/1998

Tops (KB):

BMSW* Found at 1284'

Green River 954'

A Marker 3420'

X Marker 3895'

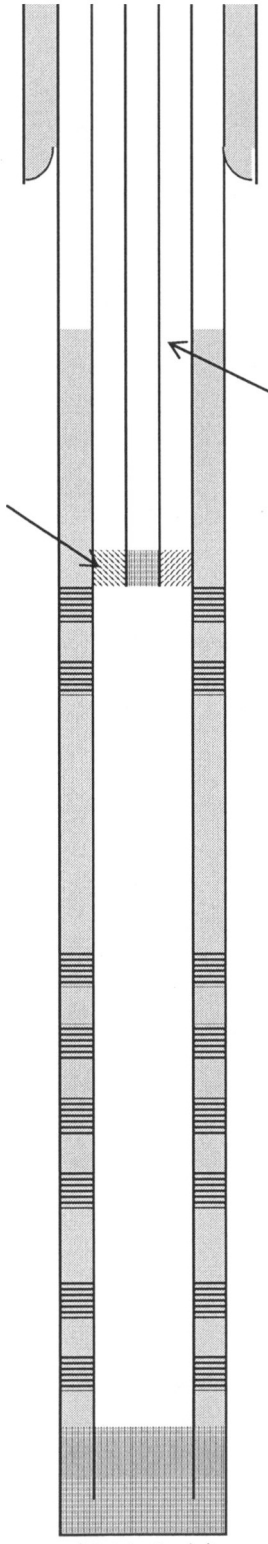
Douglas Creek 4034'

B Limestone 4400'

Castle Peak 4897'

Basal Carbonate 5388'

Injection packer @ 3754'



GL: 6274'

KB: 6284'

8 5/8" 24# Surface CSG @ 368' KB

cmt'd w/300 sx

Surface Hole size 12 1/4"

Cement top @ 1656'

5 1/2" 15.5# J-55 CSG @ 5483'

cmt'd w/430 sx

Tubing 2 7/8" 6.5# J55

Hole Size 7 7/8" bit

Perf's:

B11.1 3844' to 3848'

Add C01 3948' to 3954'

Add C02 3966' to 3971'

C02 3971' to 3975'

Add C02 3975' to 3980'

Add C03.1 3996' to 3998' and 4010' to 4013'

C06 4218' to 4221'

Add C06 4230' to 4232'

Add C09.2 4343' to 4346'

C09.2 4346' to 4352'

Add C09.2 4352' to 4356'

D01 4420' to 4424'

D3 4465' to 4468'

Add D3 4468' to 4472'

D3 4499' to 4502'

Add D3 4502' to 4505'

Add D7 4598' to 4639'

D7 4639' to 4643'

Add D7 4643' to 4663'

Add E00.2 4930' to 4932'

Add E01.1 4955' to 4960'

E01.1 4960' to 4966'

Add E01.1 4966' to 4978'

E01.2 5010' to 5016'

Add E01.2 5016' to 5028'

PBTD @ 5421' KB

TD @ 5582' KB

Petroglyph Operating Co., Inc.

Ute Tribal #31-05

(1980' FNL & 660' FWL)

SW NW Section 31, 5S- 3W

Antelope Creek Field

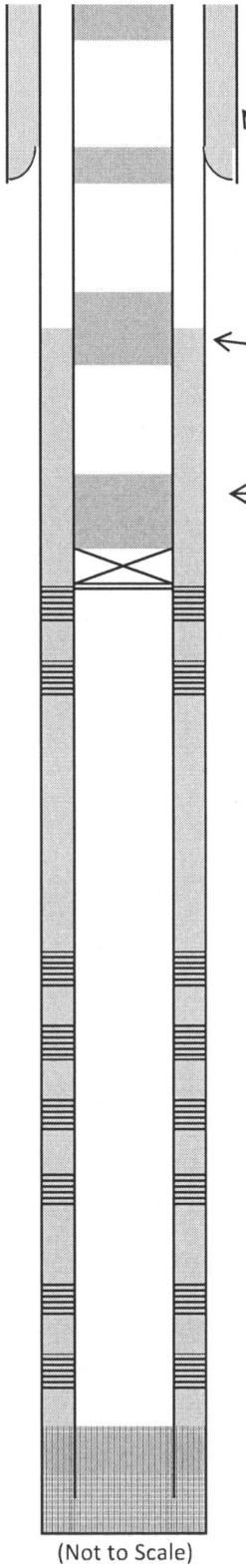
Duchesne Co. Utah

API#: 43013320350000

*Plate 1 Utah Geological Survey Special Study 144. (2012). *BMSW Elevation Contour Map, Uinta Basin, Utah.* [map]. (CA 1:200,000)

(Not to Scale)

Ute Tribal 31-05 Plug and Abandonment



8sx Class G Cement-50' plug

15sx Class G Cement-100' plug

30sx Class G Cement-200' plug

30sx Class G Cement-200' plug

CIBP @ 3754'

GL: 6274'

KB: 6284'

8 5/8" 24# Surface CSG @ 368' KB

cmt'd w/300 sx

Surface Hole size 12 1/4"

Cement top @ 1656'

5 1/2" 15.5# J-55 CSG @ 5483'

cmt'd w/430 sx

Hole Size 7 7/8" bit

Perf's:

B11.1 3844' to 3848'

C02 3971' to 3975'

C06 4218' to 4221'

C09.2 4346' to 4352'

D01 4420' to 4424'

D3 4465' to 4468'

D3 4499' to 4502'

D7 4639' to 4643'

E01.1 4960' to 4966'

E01.2 5010' to 5016'

PBTD @ 5421' KB

TD @ 5582' KB

Petroglyph Operating Co., Inc.

Ute Tribal #31-05

(1980' FNL & 660' FWL)

SW NW Section 31, 5S- 3W

Antelope Creek Field

Duchesne Co. Utah

API#: 43013320350000

*Plate 1 Utah Geological Survey Special Study 144. (2012). *BMSW Elevation Contour Map, Uinta Basin, Utah.* [map]. (CA 1:200,000)

(Not to Scale)

Maximum Allowable Injection Pressure (MAIP)
From Fracture Gradient

Date: 09/01/2015 *Operator:* **Petroglyph**

Well: **Ute Tribal 31-05**

Permit #:

Enter the following values:

Specific Gravity of injectate =	**1.010**	g/cc
Depth to top of injection interval =	**3,420**	feet
Fracture Gradient (F G) =	**0.880**	psi/ft

MAIP = **1,510** psig

(rounded down to nearest 5 psig)

where:

*MSIP = [FG - (0.433 * SG)] * Depth to top of injection interval =* *1513.931*

Cement Bond Index (in millivolts - mV)

Date: September 1, 2015

Operator: **Petroglyph**

Well: **Ute Tribal 31-05**

Permit :

Enter the following values:

Amplitude at 0% Bond (A-0) (in mV) = **72** *mV*

Amplitude at 100% Bond (A-100) (in mV) = **2** *mV*

Amplitude at 80% Bond (A-80) = **4.1** *mV*

[(0.2)log A0 + (0.8)log A100]

Amplitude at 90% Bond (A-90)= 2.9 *mV*

[(0.1)log A0 + (0.9)log A100]

Amplitude at 70% Bond (A-70)= 5.9 *mV*

[(0.3)log A0 + (0.7)log A100]

Amplitude at 60% Bond (A-60)= 8.4 *mV*

[(0.4)log A0 + (0.6)log A100]

~~Newfield Production~~ - Technical Review Worksheet

Permit No: UT2 Well: UT 31-05

What Needs to be Done	Information Sources	Review & Evaluation Notes
Determine name, top and base of the confining zone(s) and the injection zone(s).	☐ Geologic data submitted ☐ Well logs from area ☐ Published articles	Conf Zone: top 3201 base 3420 Inj Zone: top 3420 (~~Garden Gulch 2 Marker~~) base 5388 (~~top Wasatch~~)
Determine name, top and base of all USDWs. List base of lowermost USDW: Determine which USDWs are actually being used for water supply.	☐ Geologic data submitted ☐ nearby Water analyses ☐ nearby Well logs ☐ Water supply wells ☐ Published articles	Surface Elevation: GL 6274 KB 6284 Pub #92 base USDW: bgs: elev: submitted base USDW bgs: 1284 elev: base of Uinta / top Green River: 954 → USDW GREEN RIV
Review and evaluate construction, casing and cementing records of proposed well. Review and evaluate construction, casing and cementing records of AOR wells that penetrate injection zone.	☐ Data submitted ☐ Completion/workover reports ☐ Contractor invoices ☐ Logs: CBL, RTS, Temp, casing inspection, etc. not 80% 72/2 supplied is hard to read.	TD: 5582 PBTD: 5421 surface csg 8 5/8" 24# ft 0-368 s: long strg csg 5 1/2" 15.5# ft 0-5483 s: TOC: submitted: 1686 1365 CBL: 1565 (hard to read) Wells in AOR: TD TOC C 31-12 5452 1780 36-08E 31-04 5517 170 31-06 31-07 deviate
Review P&A plan for effective USDW protection, injection zone isolation and well closure.	☐ P&A plan ☐ Area geology	plug depths:
Review amount of FR - is it adequate to cover P&A costs of proposed in P&A plan?	☐ contractor bids / P&A cost histories ☐ nearby well P&A costs	FR instrument: Amount: $
Calculate the maximum allowable injection pressure (MAIP).	☐ Fracture treatments ☐ Step Rate Test results ☐ Fracture gradient	top perforation: 3844 bottom perforation: 5028 injectate specific gravity: 1.01 Frac Gradient: .88 p initial MAIP = 1510 psi
Determine which logs and tests will be performed.		